

1 **THE EMBODIMENTS OF THE INVENTION IN WHICH AN**
2 **EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS**
3 **FOLLOWS:**
4

5 1. An improved apparatus for identifying the existence of viable
6 biological particles from a particle population containing a mixture of biologically
7 viable and biologically inert particles, the improvement comprising:

8 a solid state excitation source wherein said source is a laser diode for
9 emitting a light beam being directed to contact particles of the particle population
10 and having a wavelength above about 320nm which is operative to excite
11 biomolecules contained therein to produce fluorescence;

12 a photon counter for measuring the intensity of fluorescence emitted
13 from each contacted particle and producing a signal indicative thereof; and

14 a microprocessor for comparing each contacted particle's fluorescent
15 intensity signal against predetermined criteria and establishing whether that particle
16 is a biologically viable particle or an inert particle.

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18 2. The improved apparatus of claim 1 wherein the laser diode has a
19 wavelength operative to excite biomolecules from the group consisting of NADH and
20 flavinoids.

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22 3. The improved apparatus of claim 2 wherein the laser diode has a
23 wavelength in the range of about 320 nm to about 420 nm.

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25 4. The improved apparatus of claim 3 wherein the laser diode has a
26 wavelength operative to excite NADH.

1 5. The improved apparatus of claim 4 wherein the laser diode has a
2 wavelength in the range of about 320 nm to about 360 nm.

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4 6. The improved apparatus of claim 3 wherein the laser diode has a
5 wavelength operative to excite flavinoids.

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7 7. The improved apparatus of claim 6 wherein the laser diode has a
8 wavelength in the range of about 360 nm to about 420 nm.

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10 8. The improved apparatus of claim 6 further comprising:
11 means for measuring the size of the contacted particle as indicative of
12 a biological characteristic; and

13 means for establishing the contacted particle as a candidate particle if
14 its size is within the range of particles which are respirable.

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16 9. The improved apparatus of claim 8 wherein the size measuring
17 means comprises:

18 a sequencer for directing the particles individually and sequentially
19 along a substantially linear path through air;

20 an instrument for determining the position of each particle in the
21 airstream as a function of time and the particle's time of flight between two points
22 along the linear path so as to establish the particle's size.

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24 10. The improved apparatus of claim 1 wherein the laser diode light
25 beam is emitted at a power of about 8 – 15mW.

1 11. The improved apparatus of claim 10 wherein the laser diode has a
2 wavelength operative to excite biomolecules from the group consisting of NADH and
3 flavinoids.

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5 12. The improved apparatus of claim 10 wherein the laser diode has a
6 wavelength in the range of about 320 nm to about 420 nm.

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8 13. The improved apparatus of claim 12 wherein the laser diode has a
9 wavelength operative to excite NADH.

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11 14. The improved apparatus of claim 13 wherein the laser diode has a
12 wavelength in the range of about 320 nm to about 360 nm.

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14 15. The improved apparatus of claim 12 wherein the laser diode has a
15 wavelength operative to excite flavinoids.

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17 16. The improved apparatus of claim 15 wherein the laser diode has a
18 wavelength in the range of about 360 nm to about 420 nm.

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20 17.

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1 An improved apparatus for identifying the existence of viable
2 biological particles from a particle population containing a mixture of biologically
3 viable and biologically inert particles, the improvement comprising:

4 a solid state excitation source wherein said source is a laser diode for
5 emitting a light beam being directed to contact particles of the particle population
6 and having a wavelength above about 320nm which is operative to excite
7 biomolecules contained therein to produce fluorescence;

8 means for measuring the intensity of fluorescence emitted from each
9 particle and producing a signal indicative thereof; and

10 means for comparing each particle's fluorescence intensity signal
11 against pre-determined criteria and establishing whether that particle is biologically
12 viable or an inert particle.

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14 18. The improved apparatus of claim 17 wherein the intensity
15 measuring means comprise a photon counter.

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17 19. The improved apparatus of claim 17 wherein the intensity
18 measuring means comprise a microprocessor.

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1 20. A method for identifying the existence of viable biological particles
2 from a particle population containing a mixture of biologically viable and biologically
3 inert particles, the method comprising:

4 providing a solid state excitation source wherein said source is a laser
5 diode for emitting a light beam having a wavelength from about 320nm to 500nm
6 and a detector for measuring fluorescence emission and producing a signal
7 indicative of the intensity thereof;

8 contacting the laser beam and particles of the population so as to
9 excite biomolecules contained in a contacted particle to produce fluorescence;

10 using the detector to measure the intensity of fluorescence from the
11 contacted particle;

12 comparing each particle's fluorescence intensity signal against pre-
13 determined criteria and establishing whether that particle is biologically viable or an
14 inert particle.

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16 21. The method of claim 20 further comprising:

17 measuring the size of the contacted particle as a biological
18 characteristic; and

19 establishing the contacted particle as a candidate particle if its size is
20 within the range of particles which are respirable.

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22 22. The method of claim 20 wherein the laser diode has a wavelength
23 operative to excite biomolecules from the group consisting of NADH and flavinoids.

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1 23. The method of claim 20 wherein the laser diode has a wavelength
2 operative to excite NADH.

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4 24. The method of claim 20 wherein the laser diode has a wavelength
5 operative to excite riboflavin.

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